NAVAL WAR COLLEGE
Newport, R.I.

JOINT SUPPRESSION OF ENEMY AIR DEFENSES (J-SEAD)

DEVELOPING A REALISTIC STRATEGY FOR TODAY'S OPERATIONAL ARTIST

by

DAVID B. WOODS
CDR USN

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: David B. Woods

5 March 1997

Paper directed by
George W. Jackson, Captain, USN
Chairman, Department of Joint Military Operations

R E Stevens 16 MAY 96

Faculty Advisor Date
Richard E. Stevens, JR., USN
Jerry O. Tuttle Military Chair
of
Command and Control Warfare

REPORT DOCUMENTATION PAGE

1. Report Security Classification: UNCLASSIFIED	
2. Security Classification Authority:	
3. Declassification/Downgrading Schedule:	
4. Distribution/Availability of Report: DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.	
5. Name of Performing Organization: JOINT MILITARY OPERATIONS DEPARTMENT	
6. Office Symbol: C	7. Address: NAVAL WAR COLLEGE 686 CUSHING ROAD NEWPORT, RI 02841-1207
8. Title (Include Security Classification): JOINT SUPPRESSION OF ENEMY AIR DEFENSES (J-SEAD) *DEVELOPING A REALISTIC STRATEGY FOR TODAY'S OPERATIONAL ARTIST* (U)	
9. Personal Authors: David B. Woods, CDR, USN	
10. Type of Report: FINAL	11. Date of Report: 20 May 1996
12. Page Count: 20 (Cover Page, Abstract, Text(15), Notes, Bibliography (2))	
13. Supplementary Notation: A paper submitted to the Faculty of the NWC in partial satisfaction of the requirements of the JMO Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.	
14. Ten key words that relate to your paper: **Suppression, Joint, Air Superiority, Air Defense, IADS, SEAD, J-SEAD, Electronic Warfare**	

15. Abstract: Air superiority has become a necessity of modern warfare. Airspace dominance provides overwhelming operational and tactical advantage. It is the realization of this fact that has spawned a universal effort to develop credible air defense. Almost as quickly as warfare took flight, attempts to bring it back to earth began. Suppression of enemy air defenses (SEAD) was the answer to this air power counter.

History shows the leap frog effect that technology advancements in enemy air defense and SEAD have had on each other. Defense radio detection and ranging (RADAR) equipment facilitated the development of RADAR jamming and chaff. RADAR guided surface-to-air missiles (SAM) and antiaircraft artillery (AAA) created the requirement for antiradiation missiles (ARM), drones, and decoys. Linking early warning and acquisition RADARS to SAM sites with radios and data links hastened the development of communication and data link jamming. Computer-aided networking between sites into integrated air defense systems (IADS) have produced complex service-based SEAD strategies.

In this post Cold War world, IADS evolution continues to advance as advanced SAMs and digital integration systems are peddled to the highest Third World bidder. Unfortunately SEAD improvements have failed to keep pace. Dedicated SEAD assets are dwindling without replacement. This asset erosion has rendered single service SEAD approaches ineffective as an IADS counter. The answer is development of comprehensive operational joint SEAD strategy that offers synergism of both traditional and nontraditional cross-service SEAD assets .

16. Distribution / Availability of Abstract:	Unclassified X	Same As Rpt	DTIC Users
17. Abstract Security Classification: UNCLASSIFIED			
18. Name of Responsible Individual: CHAIRMAN, JOINT MILITARY OPERATIONS DEPARTMENT			
19. Telephone: 841-[redacted] 6461		20. Office Symbol: C	

Abstract of

JOINT SUPPRESSION OF ENEMY AIR DEFENSES (J-SEAD)
DEVELOPING A REALISTIC STRATEGY FOR TODAY'S OPERATIONAL ARTIST

Air superiority has become a necessity of modern warfare. Airspace dominance provides overwhelming operational and tactical advantage. It is the realization of this fact that has spawned a universal effort to develop credible air defense. Almost as quickly as warfare took flight, attempts to bring it back to earth began. Suppression of enemy air defenses (SEAD) was the answer to this air power counter.

History shows the leap frog effect that technology advancements in enemy air defense and SEAD have had on each other. Defense radio detecting and ranging (RADAR) equipment facilitated the development of RADAR jamming and chaff. RADAR guided surface-to-air missiles (SAM) and antiaircraft artillery (AAA) created the requirement for antiradiation missiles (ARM), drones and decoys. Linking early warning and acquisition RADARS to SAM sites with radios and data links hastened the development of communication and data link jamming. Computer-aided networking between sites into integrated air defense systems (IADS) has produced complex service-based SEAD strategies.

In the post Cold War world, IADS evolution continues to advance as advanced SAMs and digital integration systems are peddled to the highest Third World bidder. Unfortunately, SEAD improvements have failed to keep pace. Dedicated SEAD assets are dwindling without replacement. Asset erosion has rendered single service SEAD approaches ineffective as an IADS counter. The answer is development of comprehensive operational joint SEAD strategy that offers synergism of both traditional and nontraditional cross-service SEAD assets.

The power of an air force is terrific when there is nothing to oppose it.

Winston Churchill

The Gathering Storm

INTRODUCTION:

Air superiority or air dominance has increasingly become an indispensable requisite if not a prerequisite in modern warfare. Due to the recognized importance air power plays in determining the outcome of conflict, integrated air defense systems (IADS) of potential enemies have grown proportionately. The counter to this counter is the ability to suppress these air defenses and enable friendly air forces to accomplish their offensive mission without self-defense becoming a consuming distraction.

While the requirement for the suppression of enemy air defenses (SEAD) increases, the funding in this warfare area is decreasing. Dedicated SEAD platforms are being retired and replaced by multi-role platforms with reduced capabilities or not replaced at all.[1] These reductions are couched with a promise for future systems that can destroy every hostile emitter minutes or even seconds after it is activated.[2] Unfortunately the technology for these new systems is still being developed and demonstrated "in pieces" through the turn of the century when the significant task of integration will begin.[3] The significance of the aforementioned reductions without replacement, for today's operational level warfighter, is the invalidation of current strategy. Resources will not support operational SEAD plans presently on the shelf.

The challenge for today's operational commander and staff is to develop effective SEAD plans that optimize the remaining dedicated mission resources and

capitalize on other available resources to solve the suppression problem. The required synergism for these plans can only be accomplished through the effective employment of joint suppression of enemy air defenses (J-SEAD).[4] This demands a shift from the service-based approach to SEAD and development of an informed, innovative, nonparochial approach to J-SEAD.

BACKGROUND:

The task of developing an integrated J-SEAD strategy may seem trivial to the casual observer. After all, many SEAD weapons are used across the services. Many onboard SEAD platform weapon systems have a similar technology base or are derivatives of a common system. The disconnect of SEAD approaches relates more to differing war fighting schemes and service based doctrine, or lack of doctrine, than technological differences. The major participants cannot even agree on whether SEAD is pronounced "SEED" or "SEA-ADD."

In view of these differences it's useful to come to closure on a common SEAD definition to bound strategy development. The Joint Staff definition of SEAD is: *any activity that neutralizes, destroys, or temporarily degrades enemy surfaced based air defenses by destructive and/or disruptive means. Thus, J-SEAD encompasses all SEAD activities provided by joint force components in support of one another.*[5] This definition is limited and does not capture the importance of SEAD in other warfare areas, such as Counter Air, Command and Control Warfare, and Information Warfare. However, it is sufficient for operational level J-SEAD strategy development. The key point to keep in mind is that SEAD is a major component of the air superiority mission. SEAD neutralizes defensive threats, enabling offensive

air forces to attack targets, and enhances survivability of these offensive air forces.[6]

HISTORY:

It is useful to briefly review a history of SEAD development to gain an appreciation of the basis for SEAD tactical approach. It is a carry over of this historical mission method that has determined service-based approach. And as a result has provided a foundation that prevails in most current operational level SEAD plans. It an understanding of the importance of these historical SEAD lessons and subsequent application that will provide the operational level staff with the essential tools for successful J-SEAD strategy development.

Air defense is just slightly younger than air attack. "There are reports of balloon and anti-balloon artillery in the American Civil War and the Franco Prussian War, and in 1890 the Russians tested a field-gun battery against a balloon moored three kilometers away."[7] Not surprising is the fact that measures to silence these defenses soon followed. Most of the measures consisted of strafing or bombing defensive positions. Thus, the concept of SEAD was born.

The introduction of radio detecting and ranging (RADAR) equipment in World War II gave air defenses "extended eyes" and greatly improved attrition rates. The SEAD counter to this technology was the arrival and use of RADAR jamming and chaff.

In Vietnam, the RADAR guided surface-to-air missile (SAM) added a new and lethal dimension to aerial warfare and ground-based air defense.[8] The SAM threat was difficult to counter, even with SAM warning receivers, attack aircraft evasive maneuvers often failed or interfered with mission accomplishment. Rebuttal to the

SAM threat was development of dedicated SEAD aircraft. The USAF Wild Weasel aircraft, with its detection and locating equipment, would actively seek out SAM sites and destroy them with antiradiation missiles (ARM). The USN EA-6 Prowler aircraft would accompany strike groups to a position where enemy early warning and acquisition RADARS would be tactically jammed. This eliminated advanced detection, decreased SAM reaction time, prevented target tracking and hindered missile engagement. This "system versus system" approach was a major milestone in SEAD technology development. This approach is still applicable today. The goal of Operation Deliberate Force in the fall of 1995 was prosecution and destruction of individual Bosnian Serb SAM sites after the shootdown of a USAF F-16.[9]

The next step in the evolution of air defense came during the Cold War. The Soviets and Soviet supported countries began to integrate their ground-based air defense batteries into layered area air defense schemes. These integrated defense schemes linked together early warning, acquisition, and engagement information. This method made the isolation and disruption of a single system difficult and often ineffective.

One of the first campaigns against an integrated air defense system (IADS) was in the Bekaa Valley during the early 1980s. The Syrians in support of their operations in Lebanon, constructed an elaborate IADS. SAM and antiaircraft artillery (AAA) sites were placed to provide a defense against Israeli attacks into South Lebanon. Their placement also provided the Syrians a defended attack corridor into Israel. The Israelis countered with a three-phase strike plan that include the use of deception, key site harassment and minor destruction, and finally the actual destruction of IADS sites.[10] The destruction of the Syrian IADS was the Israeli

objective and not just a tactic to reduce attrition of their attack aircraft going on to other targets. Use of drones, jamming, chaff, ARMs, and hardkill weapons was very effective. The Syrian IADS were in ruins only a few hours after the Israeli offensive began. The IADS had been saturated and overloaded, and the use of overwhelming force had prevailed. Centralized control of the IADS had crumbled and individual sites did not engage due to confusion, fear, and lack of information.

Although this SEAD victory had taken place in a limited geographic area, the effectiveness of a coordinated SEAD effort was graphically demonstrated. Many principles of operational art are evident in the Israeli plan. Clear objective, unity of effort, surprise, security, operational fires, use of overwhelming force, deception, branches, and sequels were all skillfully employed to defeat the Syrian IADS.

In the mid 1980s, the United States conducted simultaneous raids on Tripoli and Benghazi, Libya in response to blatant state-sponsorship of international terrorism. In contrast to the Bekaa Valley, the objective of these raids was not the Libyan IADS but the confirmed terrorist training and support sites. The SEAD plan focused on IADS disruption long enough to allow raid aircraft to ingress, strike their targets, and egress. The extensive Libyan IADS, based on Soviet equipment and design, posed a formidable threat for the raid aircraft. This obstacle was overcome largely by using advancements in technology. Computer-based mission planning and intelligence gathering played a significant role in plan rehearsal and refinement. Use of the advanced high-speed antiradiation missile (HARM) made direct attack of the IADS sites unnecessary. The employment of EA-6 and EF-111 aircraft was the key difference between Israeli and American tactics. RADAR jamming of major portions of the IADS, as opposed to destruction or piecemeal jamming, played a

much larger role than it had for the Israelis in 1982.[11]

The Libyan raids marked the first semi-joint venture into the SEAD arena. US Navy provided all of the HARM aircraft and two-thirds of the jamming aircraft. The USAF provided the remaining jammers.[12] This joint effort was born more of necessity than design. Tanker requirements, overflight restriction, and political sensitivities kept the USAF from using more of their own dedicated SEAD assets. Nonetheless, a coordinated, semi-joint SEAD venture had been undertaken with no loss of raid aircraft to the Libyan IADS. Operational scheme of the raid plans included surprise, unity of effort and economy of force.

The Gulf War was the next move in the IADS/SEAD chess game. When US and Coalition countries moved into Saudi Arabia, they found that Iraq had amassed an impressive hybrid IADS that combined not only Soviet but Western European systems. The IADS was developed and adapted by doctrine forged in eight years of war with IRAN. It consisted of several thousand RADARS, approximately 10,000 pieces of AAA, up to 17,000 SAMs, and the seventh largest air force in the world. It was all tied together with a modern integrated command and control system.[13] Countering this IADS and gaining air superiority over the entire theater required a different and much more comprehensive approach than previously attempted. The situation dictated more than just dedicated SEAD assets alone. Centralized joint command and decentralized execution were the hallmarks of the campaign. Stealth aircraft were used to strike key C^3 structures; bombers destroyed key sites in concert with HARM shooters and jammers; airborne communication jammers targeted critical battlefield communication links with Iraqi fighter aircraft and radio-

dependent firing units. What could not be jammed was targeted with ARMs; what could not be taken out with jamming or ARMs was slated for destruction with standoff weapons.[14] The SEAD attack on the Iraqi IADS had five objectives:

1) Destroy/Disrupt C2 Nodes
2) Disrupt Electronic Warfare (EW)/Ground Controlled Intercept (GCI) Coverage and Communication
3) Force Air Defense Assets into Autonomous Modes
4) Use Expendable Drones for Deception
5) Employ Maximum Available HARM Shooters

The idea was to break Iraq's centralized air defense system into chunks and then smash it to pieces.[15]

The Desert Storm SEAD effort was not conducted as an independent phase that proceeded strikes on other targets. It was run concurrent with both initial and follow-on offensive air action. The SEAD effort combined the disruptive raid mentality of Libya and the destructive campaign mentality of Bekaa Valley. The difference was instead of lasting minutes or hours, air operations lasted six weeks. The plan, like Bekaa Valley, incorporated clear objectives, unity of effort, surprise, security, operational fires, overwhelming force, deception, branches, and sequels. It also included unity of command, mass, and sustainment. However, the SEAD effort fell short of really being joint. "Although the Air Tasking Order orchestrated the complex air operations, most Air Force strikes were covered by the Air Force SEAD, and all Navy/Marine strikes were covered by Navy/Marine SEAD."[16] The Coalition forces had little or no indigenous SEAD capabilities thus the United States became the SEAD supplier. Most Coalition SEAD support was relegated to the Navy and Marines. More than 60 percent of Desert Storm SEAD sorties were flown by Navy

and Marine aircraft.[17]

THE THREAT:

The buildup of a sophisticated IADS by a Third World country seen in Iraq is the harbinger of the future. The demise of the former Soviet Union and end of the Cold War has been a catalyst for a revolution in the international arms market. Advanced Soviet weapons are available on both the open and black markets. Most are sold at a fraction of the original cost. Colonel Ronald R. Barrett, Air Staff Chief of Policy and Requirements Management, has a photo taken at a recent international air show depicting an array of Soviet-developed SAMs and RADARS. Referring to it Colonel Barrett observed, "We know Moscow is having a garage sale. That stuff is out there."[18]

The flood of Soviet equipment on the arms market has forced other suppliers to react. This reaction has not only been in the form of decreasing prices but also includes development and sale of more advanced technology weapons and RADARS. The majority of this equipment is built to counter US capabilities. This mono-polar, post Cold War world has created an environment where weapon systems are measured and marketed by their comparison to or ability to defeat US weapons. A RADAR, being displayed at the Paris Air Show in 1994, claimed the ability to see stealth, immunity to jamming and insusceptibility to ARM.[19] This is the wave of the future. The US military is "the king of the mountain" and how a country stacks up against the king is the gauge for success.

It is realized that no air power in the world can equal Western air forces. Because of this, the trend is not toward air-to-air defense but more focused on a surface-to-air defense. "Many Third World nations have modern fighters, but they are bought in limited numbers and employed even less. Recent history shows conservation of aircraft and reliance on surface-based air-defense assets for protection by Third World countries."[20] The threat to air superiority today and in the future is an enemy's IADS and not their air force.

Another significant element in IADS development and refinement is the transfer of information between systems. The digital computer has opened a new realm of possibilities. A complete segment of the arms development market has evolved which is dedicated to melding the separate computer, RADAR, and data transmission technologies together. "Information technology's aim is building devices that tie other systems together to exchange data efficiently. This makes the entire IADS process even more fluid and dynamic, presenting SEAD with its biggest challenge since Vietnam."[21]

One of the first manifestations of use of this data transfer technology was in Iraq with use of the KARI system. The French aerospace firm Thompson-CSF designed the computer based system that tied together information from hundreds of tracking posts and RADARS. This information was disseminated to fighter aircraft, SAM batteries, and antiaircraft artillery through Intercept Operations Centers. Thompson had designed an automated system that Third World officers with as little as a sixth-grade education could operate. It was the best 1970's technology that a Third World country could buy and gave Baghdad its "situational awareness."[22] US

and Coalition forces overcame the KARI system with its 1970's technology base. The real question becomes how will we fair against a 1990's digitally based IADS?

CURRENT SEAD DOCTRINE:

The Joint Staff with publication of Joint Pub 3-01.4, *Joint Tactics Techniques and Procedures for Joint Suppression of Enemy Air Defenses (J-SEAD),* attempts to define and describe J-SEAD planning, coordination, and command and control responsibilities.[23] The problem lies in the fact that there is no bridge between experienced-based service SEAD tactics and techniques and joint based doctrine. The practical link between tactical level SEAD and operational level J-SEAD is not present. The development of this critical link requires a basic knowledge of service approaches to SEAD.

The US Air Force views SEAD as a subset of Electronic Combat (EC), which besides SEAD includes Electronic Warfare (EW) and Command, Control, and Communications Countermeasures (C^3CM). Since Vietnam the USAF has relied on its "EC triad" (F-4G reactive HARM shooter, EF-111 tactical RADAR jammer, and EC-130H C^3CM aircraft). This triad has shouldered the lion's share of SEAD planning and action.[24] Other aircraft, not equipped with dedicated SEAD systems, have treated the destruction of IADS elements as just another strike target. In fact, the use of strike aircraft has traditionally been heavily supported by EC triad aircraft. The core of USAF SEAD strategy is designed for a prolonged campaign and not just a raid or isolated strike. Unfortunately, two legs of the EC triad have fallen prey to

the budget axe subsequent to their successful employment in the Gulf War. First, the F-4G has been retired and replaced by the multi-role F-16 with its HARM Targeting System (HTS). The HTS F-16 is widely recognized to be less capable in the dedicated SEAD role than the F-4G. Second, the EF-111 is scheduled to be out of the inventory by 1997 and replaced by excess USN EA-6s.[25] Obviously these reductions have had a serious negative affect on the "EC triad" concept. How USAF SEAD doctrine will change, considering these reductions, is yet to be revealed. It appears that whatever form the new doctrine takes it will rely heavily on other service participation.

The US Navy in contrast views SEAD as one of several missions for its multi-purpose aircraft. An example of this philosophy is the EA-6 that does RADAR and communication jamming, and fires HARM; these tasks would require three different USAF aircraft. In addition all Navy fighter/attack aircraft (except the F-14) can fire the HARM with systems similar to the F-16 HTS.[26] Navy plans also include use of Tactical Land Attack Missiles (TLAM) to surgically remove key IADS nodes. Navy SEAD strategy is less formal than USAF. Its cross-platform structure has been driven by two main factors. First, limited carrier deck space. Second, the experience of the Navy being called upon to conduct raids or limited strikes of short duration over the past decade. Unlike the Air Force, this multi-mission approach means that Navy SEAD-capable assets will be in the inventory for the foreseeable future. The stark reality is that two carrier wings will carry more SEAD punch than the entire Air Force inventory projected for 1997.[27] It is clear that the Navy is now or will soon be relied upon for a leading role in J-SEAD. Picking up the prolonged

campaign role will be a major challenge.

The US Marines view SEAD as a tactical concept designed to support Marine objectives but not as an objective itself. Although SEAD is not mentioned as concept in primary Marine doctrinal manuals, they use their EA-6B and F/A-18 aircraft to perform SEAD tactics that support Marine operations.[28] The prevailing attitude used to be that Marine SEAD assets would support Marine operations first and any excess SEAD capabilities would then be released for joint use. This attitude is rapidly changing as Marine SEAD assets are tasked separately from other Marine forces. This fact is evidenced by recent EA-6B and F/A-18 squadron level deployments to Aviano, Italy in support of Operation Deny Flight.

The US Army's view of SEAD is more a tactical concept than the specific weapons and procedures employed by the other services. As such, artillery, special forces, heliborne assault, and ground-based electronic jamming are used to perform the suppression mission.[29] Most Army SEAD efforts focus on local air superiority unless tasked by the operational commander for a J-SEAD role. Often Army forces are the indirect beneficiaries of SEAD because of the air superiority umbrella it provides.

THE NEED FOR AN OPERATIONAL LEVEL J-SEAD STRATEGY:

Future operational level tasking may vary in scope and direction but the key principles of war will be present. History has taught the importance of objective, offensive, mass, maneuver, unity of command, and simplicity. However, recent

events have punctuated the need for careful examination and application of: economy of force, security, and surprise.

Economy of force is becoming critical based on two factors. First, global presence in multiple potential hot spots, means some tasking may not garner top priority. Second, fiscal reality, downsized force structure, and operational tempo of the remaining forces, may limit resources available for any action short of war.

Security of own forces will be crucial.

> In the future, not only will we be forced to operate in an economy-of-force theater, we will also be operating in a political environment that will require commanders to understand that we may have an "economy of national will." The American people simply are not going to tolerate high casualties in military operations they don't view as critical to our national security.[30]

Strategic surprise will be a luxury that may not be available in future actions. Reductions in overseas basing and forward deployed units, means that often forces must be drawn from US home base locations. Availability of information from satellites and media interest will in all likelihood prevent concealed movement of these forces. This fact makes the requirement for operational and tactical level surprise all the more acute.

A comprehensive operational level J-SEAD strategy will contribute significantly to these important principles. Despite SEAD force reductions, the unity of effort that a well-designed J-SEAD strategy will provide, translates well into a force multiplier. An adept SEAD plan, as history has shown, contributes significantly to air superiority and other warfare areas. This unity of effort will ensure proper application of limited assets, reduce attrition, and subsidize economy of force across warfare

areas.

As previously shown, SEAD roots are firmly based on the concept of force security. Operational J-SEAD strategy will allow this precept to continue. The measure of effectiveness of the SEAD effort is safe passage and return of offensive air forces. The Pentagon reaction to the shoot down of an Air Force F-16 carrying an ALQ-131 jammer pod was an order that all missions over the Balkans would include escort jammer aircraft.[31] A workable J-SEAD plan would ideally prevent higher level intervention by minimizing such unfortunate losses.

The objective of SEAD is to blur the eyes, disable the ears, and pull the teeth of an enemy's IADS structure. Accomplishment of this objective serves as an enabler for surprise at the operational and tactical level. The deception and cover provided by a well-thought-out J-SEAD strategy cannot be overstated.

DEVELOPING A REALISTIC J-SEAD STRATEGY:

The operational J-SEAD strategy must be developed for execution across the spectrum of warfare from war to military operations other than war (MOOTW). The applicability of J-SEAD in war is readily apparent but perhaps less obvious is J-SEAD's role in MOOTW efforts around the world. As US and Coalition air forces are tasked with surveillance and "no fly" enforcement missions over hostile territory, effective J-SEAD takes on added importance.[32]

The operational staff has the weighty task of developing a J-SEAD strategy against a dynamic and difficult threat. Countering this threat requires not only a

thorough understanding of enemy capabilities but also a firm grasp of own force potential and availability. Research into service-based SEAD tactics will pay large dividends in planning. The staff should not attempt to reinvent the wheel developing SEAD tactics but rather orchestrate these tactics into intelligent plans to accomplish the desired ends. Knowledge of how SEAD forces are organized and tasked will also contribute to mission planning success. Creativity should to be concentrated on the utilization of forces that traditionally may not have been considered SEAD assets. Use of stealth and TLAM against critical IADS nodes are a good example of this thought outside the "box." Operational commanders should keep pressure on supporting commanders to train SEAD forces for the J-SEAD mission. Care must also be taken to ensure J-SEAD asset developments keep pace with the threat by maintaining appropriate priority on the operational commander's integrated priority listing (IPL).

The requirement for J-SEAD is illustrated and well documented. The responsibility for J-SEAD strategy development falls squarely on the shoulders of the operational commander and staff. No doubt this is an ominous and foreboding task, nonetheless it is achievable with available resources if properly organized. Movement away from parochial serviced-based SEAD approaches and toward a more comprehensive meld of these proven approaches will ensure J-SEAD is ready to counter the IADS of the future. "The success of modern US military strategy depends on forces organized, trained, and equipped for division of combat labor."[33]

NOTES

1. John A. Tirpak, "Electronic Warfare, Economy Style," *AIR FORCE Magazine*, November 1995, p.24.

2. William A. Owens, "The Emerging System of Systems," Naval Institute *Proceedings*, May 1995, p.39.

3. Tirpak, p.29.

4. Joint Chiefs of Staff, *JTTP for Joint Suppression of Enemy Air Defenses (J-SEAD), Joint Pub 3-01.4*, (Washington: July 1995), p.IX.

5. Ibid., p.V.

6. Kenneth G. Krech, "The Navy Must Suppress Enemy Air Defenses," Naval Institute *Proceedings*, October 1995, p.76.

7. Kenneth P. Werrell, *Archie, Flak, AAA, and SAM: A Short Operational History of ground based Air Defense*, (Maxwell AFB: Air University Press, 1988), p.1.

8. William A. Hewitt, *Planting the Seeds of SEAD, The Wild Weasel in Vietnam*, (Maxwell AFB: Air University Press, 1993) p.8.

9. CDR Brian Bennitt, VAQ-141 Post Deployment Debrief, NAS Whidbey Island, Washington, October 1995.

10. James R. Brungess, *Setting the Context, Suppression of Enemy Air Defenses and Joint War Fighting in an Uncertain World*, (Maxwell AFB: Air University Press, 1994), pp.16-22.

11. Ibid., pp.26-27.

13. Brungess, p.38.

14. Ibid. p.41.

15. BGEN Buster Glossen's memorandum, quoted in Michael R. Gordon and Bernard E. Trainor, *The Generals' War, The Inside Story of the Conflict in the Gulf*, (Boston: Little, Brown and Company, 1995), p.111.

16. Krech, p.77.

17. William J. Luti,"*Battle of the Airwaves,*" Naval Institute *Proceedings*, January 1992, p.52.

18. Tirpak, p.27.

19. Dr. Daniel Henderson, 10th EA-6B Operational Advisory Group address, NAS Whidbey Island, Washington, October 1994.

20. Krech, p.77.

21. Brungess, p.178.

22. Gordon and Trainor, pp.106-107.

23. *JTTP for Joint Suppression of Enemy Air Defenses (J-SEAD)*, p.i.

24. Brungess, p.104.

25. U.S. Secretary of Defense Office, *Program Budget Decision (PDB) 752 and 753*, (Washington: December 1994).

26. Krech, p.78.

27. Ibid., p.77.

28. Brungess, p.120-121.

29. Ibid., p.114.

30. Carl E. Munday, Jr., "Reflections on the Corps: Some Thoughts on Expeditionary Warfare," *Marine Corps Gazette*, March 1995, pp. 26-29.

31. Tirpak, p.27.

32. Krech, p.77.

33. Department of the Navy, . . . *From the Sea: Preparing the Naval Service for the 21st Century*, (Washington: September 1992), p.5.

BIBLIOGRAPHY

Bennitt, Brent M. "Joint Tactical Airborne Electronic Warfare." *Naval Aviation News,* March-April 1995, 1.

Brungess, James R. *Setting the Context, Suppression of Enemy Air Defenses and Joint War Fighting in an Uncertain World.* Maxwell AFB: Air University Press, June 1994.

Curry, Peter E. *Does Current Suppression of Enemy Aid Defenses Doctrine Support Air Maneuver?* Fort Leavenworth, Kansas, 1994.

Department of the Navy. . . . *From the Sea: Preparing for the 21st Century.* Washington: September 1992.

Gershanoff, Hal. "EC in the Gulf War - An Exclusive JED Interview with the Director of Air Operations for Desert Storm." *Journal of Electronic Defense*, May 1991, 37-48.

Hewitt, William A. *Planting the Seeds of SEAD, The Wild Weasel in Vietnam.* Maxwell AFB: Air University Press, June 1993.

Hutcherson, Norman B. *COMMAND & CONTROL WARFARE, Putting Another Tool in the War-Fighter's Data Base.* Maxwell AFB: Air University Press, September 1994.

Joint Chiefs of Staff. *JTTP for Joint Suppression of Enemy Air Defenses, Joint Pub 3-01.4.* Washington: 25 July 1995.

Knowles, J. "Air Force Breathes New Life into SEAD Mission." *Journal of Electronic Defense*, March 1995, 22.

Krech, Kenneth G. "The Navy Must Suppress Enemy Air Defenses." US Naval Institute *Proceedings*, October 1995, 76-79.

Kromhout, Gert. "The WILD WEASEL Controversy." *Military Technology,* Issue 8, August 1995, 42-47.

Luti, William J. "Battle of the Airwaves." US Naval Institute *Proceedings*, January 1992, 49-55.

Munday, Carl E. Jr. "Reflections on the Corps: Some Thoughts on Expeditionary Warfare." *Marine Corps Gazette*, March 1995, 26-29.

Owens, William A. "The Emerging System of Systems." US Naval Institute *Proceedings*, May 1995, 35-39.

Tirkpak, John A. "Electronic Warfare, Economy Style." *AIR FORCE Magazine,* November 1995, 24-30.

Gordon, Michael R. and Bernard E. Trainor. *The Generals' War: The Inside Story of the Conflict in the Gulf.* Boston: Little, Brown and Company, 1995.

US Secretary of Defense Office. *Program Budget Decision (PBD) 752 and 753.* Washington: December 1994.

Werrell, Kenneth P. *Archie, Flak, AAA, and SAM: A Short Operational History of Ground Based Air Defense.* Maxwell AFB: Air University Press, 1988.